page 17, line 22 to page 18, line 12. New claims 16-26 are derived from claims 1-14. New claims 27-37 find support in the Specification on page 2, lines 27-29. No new matter has been added.

Drawing Objections

The Examiner indicates that the drawings are objected to for the reasons indicated on FORM PTO 948. Applicants enclose corrected drawings, thereby overcoming the objection.

Claim Objections

The Examiner has objected to claim 14 as being in improper form as a multiple dependant claim. Applicants have amended claim 14, clearly indicating that it depends only from claim 13. Thus, Applicants have obviated the objection.

The Examiner has objected to claim 8 as being dependent on non-elected claims. Applicants have amended claim 8 to depend from claim 1, thereby obviating the objection.

The Examiner has objected to claims 9 and 11 based on informalities of punctuation and the use of articles. Applicants have amended these claims, thereby overcoming the objection.

Rejection Under 35 U.S.C. § 101

The Examiner has rejected claim 15 because the claim recites a use without setting forth any steps involved in the process. Applicants have canceled claim 15, thereby overcoming the rejection.

Rejection Under 35 U.S.C. § 112, first paragraph

Written Description

The Examiner has rejected claims 1-3, 5 and 8-15 as lacking written description. The Examiner contends that the claims are broadly drawn to a multitude of DNA molecules that comprise a companion cell specific promoter operably linked to a sucrose transporter gene, and plant cells transformed with those DNA molecules. The Examiner further contends that while the instant Specification describes a sucrose transporter gene from spinach, the second example found in the Specification (EMBL Accession No. G21319) is actually a human EST that is too short to encode a full-length sucrose transporter. The Examiner also contends that the sequence of *RolC* and the *Arabidopsis* sucrose transporter promoter are the only sequences given for companion cell promoters. The Examiner concludes that the description in the instant Specification does not support the full scope of the claims. Applicants respectfully traverse.

The instant invention is directed to a process for increasing the yield of plants which comprises transforming a

plant with at least one recombinant DNA construct comprising (a) a region that directs transcription specifically in the companion cells and which is operatively linked to (b) a nucleic acid sequence encoding a polypeptide, such as a sucrose transporter. The invention is also directed to the recombinant construct that comprises (a) a region directing transcription specifically in the companion cells and operatively linked to (b) a nucleic acid sequence encoding a polypeptide, such as sucrose transporter, whereby expression of the construct increases plant yield. The nucleic acid sequences of (a) and (b) are not new or unique *per se*. That is, any nucleic acid sequence that has been identified as directing companion cell expression or encoding, for example, a sucrose transporter polypeptide can be used.

The standard for the written description requirement is that an applicant must clearly convey the information that he has invented the subject matter which is claimed so that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention. In this case, one skilled in the art would realize that any gene sequence present in the data bank that is identified as, for example, a sucrose transporter would be useful. Similarly, one skilled in the art would be able to identify regions, such as promoters, that have the ability to direct expression in companion cells. Thus,

Applicants respectfully submit that they have met the written description requirement and note again that no new sequences are presented in this application. Thus, the Examiner is respectfully requested to reconsider and remove the rejection.

Enablement

The Examiner has rejected claims 1-3, 5 and 8-15 for lacking enablement. The Examiner acknowledges that the claims are enabled for a method of increasing the yield of plants by transformation with a construct comprising the *rolC* promoter operably linked to the sucrose transporter gene from spinach. She contends, however, that the Specification does not enable any person skilled in the art to conduct the method or make the construct using any companion cell specific promoter or any sucrose transporter gene. Applicants respectfully traverse.

As noted above, the application does not present any new sequence data. Instead, it combines two types of known nucleic acid sequences; regions directing companion cell specific expression and sequences encoding a particular polypeptide, such as a sucrose transporter. As with the written description requirement standard, meeting the enablement requirement depends one whether on skilled in the art would be able to make and use the invention relying on the disclosure of the application. Here, again, it is routine, standard procedure to search the

gene database for sequences having a giving definition, such as "sucrose transporter."

Section 2164.01(b) of the MPEP states "As long as the Specification discloses at least one method for making and using the claimed invention that bears a reasonable correlation to the entire scope of the claim, then the enablement requirement of 35 U.S.C. 112 is satisfied." "Failure to disclose other methods by which the claimed invention may be made does not render a claim invalid under 35 U.S.C. 112." In addition, Section 2164.03 states "The more that is known in the prior art about the nature of the invention, how to make, and how to use the invention and the more predictable the art is, the less information needs to be explicitly stated in the Specification." Applicants assert that one skilled in the art is intimately familiar with the contents of gene sequence databases and the procedures for accessing the information contained therein. Thus, extensive descriptions of how to isolate new genes that would be defined as, for example, sucrose transporters is unnecessary. Thus, Applicants respectfully submit that they have met the enablement requirement and request reconsideration and removal of the rejection.

Rejection Under 35 U.S.C. § 112, second paragraph

The Examiner has rejected claims 1-3, 5 and 8-15 as being indefinite because they fail to recite positive method steps and because they lack agreement between the preamble of the methods and the positive method steps.

Applicants have amended the claims to recite the positive steps involved in the method, thereby obviating the rejection.

The Examiner has rejected claims 1, 9-10, 12-13 and 15 as indefinite in the recitation of the word "containing." In addition, the Examiner points out that claim 14 is indefinite in its recitation of "contains."

Applicants have amended the claims substituting the word "comprising" or "comprises" for the terms "containing" and "contains." Thus, Applicants have overcome the rejection.

The Examiner has rejected claim 9 as indefinite for its recitation of "yields."

Applicants have amended the claim to recite "yield," thereby obviating the rejection.

The Examiner indicates that in claim 11, "which" should be replaced with "--, wherein the vector--." Applicants have made this change.

The Examiner indicates that claim 15 is indefinite for failing to recite any active, positive steps delimiting how

"use" is actually practiced. Applicants have deleted claim 15, thereby obviating the rejection.

Rejection Under 35 U.S.C. § 103

The Examiner has rejected claim 1-2, 5 and 8-15 as being unpatentable over Frommer et al., in view of Kuhn et al. The Examiner contends that Frommer et al disclose tobacco plants transformed with a construct comprising a sucrose transporter gene from spinach expressed behind a constitutive promoter. Frommer et al. teach that such plants have increased yield, but do not disclose plants transformed with a sucrose transporter gene expressed behind a companion-cell specific promoter.

The Examiner also contends the Kuhn et al. teach potato plants transformed with a DNA construct comprising the companion cell specific *rolC* promoter operably linked to the potato *SUT1* sucrose transporter in the antisense orientation.

The Examiner concludes that it would have been obvious to one of ordinary skill in the art to modify the method of Frommer for increasing the yield of plants by transforming with a spinach sucrose transporter operatively linked to the *rolC* promoter. She contends that one of ordinary skill in the art would have been motivated to do so because Kuhn et al. teach that plants transformed with antisense *SUT1* expressed by a companion cell promoter have reduced tuber yield and, according

to the Examiner, one of skill in the art would know that overexpression would have the opposite effect.

Applicants respectfully traverse. The Examiner's statement that "…plants transformed with antisense *SUT1* expressed behind a companion cell promoter have reduced tuber yield…one of skill in the art would know that that overexpression would have the opposite effect" is simply wrong. A paper authored by Kneissl and Deiknan that was published in the journal *Plant Physiology* in 1996 investigated the tomato E8 gene and its influence on ethylene biosynthesis in fruit and flowers. These authors report that previous experiments in which antisense suppression of E8 was used suggested that the E8 protein has a negative effect on ethylene evolution in fruit. When a cauliflower mosaic virus 35S-E8 gene was introduced into plants, however, they obtained plants with overexpression of E8 and plants in which E8 expression was suppressed due to co-suppression. Co-suppression in plants is a phenomenon by which overexpression of a gene actually results in reducing expression. In the Plant Physiology paper, the authors report that while co-suppression reduced the E8 protein level and led to elevated level of ethylene evolution, overexpression of E8 did not effect the level of ethylene evolution. Thus, the Examiner's contention that an opposite effect would occur by introducing the sense orientation of a gene as opposed to the

antisense orientation is not supported in scientific fact and is an oversimplification of biology. In addition to the lack of motivation, one skilled in the art would have no expectation of success based only upon the teachings of these two references. Thus, the Examiner fails to make a case for obviousness and Applicants respectfully request reconsideration and removal of the rejection.

The Examiner has rejected claim 3 as being unpatentable over Frommer et al., in view of Kuhn as applied to claims 1-2, 5 and 8-15 above and further in view of Leggewie et al. The combination of Frommer et al. and Kuhn et al. are discussed above. Leggewie et al teach a method of transforming plants with DNA constructs comprising a promoter operably linked to a bacterial sucrose transporter. The Examiner contends that it would have been obvious to a skilled artisan to modify the method for increasing the yield of plants by transforming plants with a sucrose transporter gene from bacteria expressed behind a companion-cell specific promoter. She contends that one of ordinary skill in the art would have been motivated to do so because the two genes are functional equivalents and it would have been obvious to substitute one functional equivalent for another. Applicants respectfully traverse.

Applicants refer to the above discussion of the Frommer et al and Kuhn et al. papers. Since one of ordinary skill in the

art would have had no expectation for success using the *SUT1* sucrose transporter, they would have had no expectation for success using a sucrose transporter from bacteria. In fact, there is no motivation for making this combination and using it to transform plants in order to obtain increased yield. Thus, Applicants respectfully request reconsideration and removal of the rejection.

In view of the above remarks, all of the claims remaining in the case are submitted as defining non-obvious, patentable subject matter.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Leonard R. Svensson (Reg. No. 30,330) at 714-708-8555 in Costa Mesa, CA to conduct an interview in an effort to expedite prosecution in connection with the present application.

Attached hereto is a marked-up version of the changes made to the application by this Amendment.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), the Applicant respectfully petitions for a three (3) month extension of time for filing a response in connection with the present application and the required fee of $920.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By _____
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LRS/SWG/sbp
0147-0191P

Attachment: Version with Markings to Show Changes Made

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Alexandria, VA 22231 on: 10.10.02

BIRCH, STEWART, KOLASCH & BIRCH, LLP

(Signature)

10.10.02
(Date of Signature)

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OCT 17 2002
PATENT & TRADEMARK OFFICE

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Please replace lines 23 and 24 on page 3 with the following:

--preferably is of plant origin [for example EMBL gene bank accession number G21319]. Particularly preferred the sequence described in (b) encodes a sucrose--

Please replace lines 1-14 on page 11 with the following:

--**Figure 5** Schematically shows the cloning strategy of ΔPMA1.

[Step from A to B]

Figure 5A The H^+-ATPase ΔPMA1, which was truncated at the 3' end, was amplified via PCR with the ΔPMA1 cDNA as the matrix and complementary internal primers [(A)].

Figure 5B The flanking cleavage sites of the PCR product [(B)] were introduced via the correspondingly synthesized primers.

[Step from B to C:]

Figure 5C Pst1/Not1 digestion of the fragment shown in Figure 5B and cloning of the PCR fragment into the *E. coli* vector SK- via Pst1/Not1 cleavage sites [(C)].

[Step from C to D:]

Figure 5D Bcl1/Spe1 digestion of the plasmid SK-ΔPMA1 as shown in Figure 5C and cloning of the fragment into the compatible BamHI/XbaI cleavage sites of pBinRolC [(D)].--

Please replace lines 22-28 on page 11 and lines 1-6 on page 12 with the following:

-- [Step from A to B:]

Figure 8A The H^+-ATPase ΔPHA2, which was truncated at the 3' end, was amplified via PCR with the PHA2 cDNA as the matrix and complementary internal primers [(A)].

Figure 8B The flanking cleavage sites of the PCR product [(B)] were introduced via the correspondingly synthesized primers.

[Step from B to C]

Figure 8C PstI/EcoRI digestion and cloning of the PCR fragment as shown in Figure 8B into the *E. coli* vector SK- via PstI/EcoRI cleavage sites [(C)].

[Step from C to D]

Figure 8D BglII/SpeI digestion of the plasmid SK-ΔPHA2 as shown in Figure 8C and cloning of the

fragment into the compatible BamHI/Xbal cleavage sites of pBinRolC [(D)].--

IN THE CLAIMS:

The claims have been amended as follows:

1. (Amended) A process for increasing the yield of plants, [characterized in that recombinant DNA molecules containing] comprising transforming a plant with at least one recombinant DNA construct comprising

(a) a region allowing the transcription specifically in the companion cells; and operatively linked thereto

(b) a nucleotide sequence encoding a polypeptide selected from the group consisting of:

(c) proteins with an enzymatic activity that cleaves sucrose;

(g) sucrose transporters;

(h) proteins the activity of which leads to the stimulation of the proton gradients located at the plasma membrane of plant cells; and

(i) citrate synthases;

[and which are] wherein said at least one construct is stably integrated into the genome of said plant[s are expressed] .

8. (Amended) The process [of any one of claims 1 to 7] according to claim 1, wherein the region mentioned in (a) is the *rolC* promoter from *Agrobacterium rhizogenes*.

9. (Amended) A recombinant nucleic acid molecule [containing] comprising

(a) a region allowing the transcription specifically in the companion cells of plants; and operatively linked thereto

(b) a nucleotide sequence encoding a polypeptide[,] selected from the group consisting of

(i) sucrose synthases;
(ii) sucrose phosphorylases;
(iii) sucrose transporters;
(iv) proteins the activity of which leads to the stimulation of the proton gradient located at the plasma membrane of plant cells; and
(v) citrate synthases,

wherein said recombinant nucleic acid molecule, when stably integrated into the genome of plants and expressed, leads to an increase of the yields of plants.

10. (Amended) A vector [containing] comprising a recombinant nucleic acid molecule of claim 9.

11. (Amended) The vector of claim 10 [which] wherein the vector is suitable for [the] transformation of plant

cells and for integration of foreign DNA into the plant genome.

12. (Amended) A plant cell transformed with and [containing] comprising a recombinant nucleic acid molecule of claim 9.

13. (Amended) A plant [containing] comprising plant cells of claim 12, wherein the plant shows an increased yield in comparison to a corresponding non-transformed plant due to the expression of the recombinant nucleic acid molecule in the companion cells of the plant.